

CLAIMS:

1. An aluminium processing apparatus for separating molten aluminium from a mixture of molten aluminium and aluminium dross comprising:

a table for supporting an insulated crucible, the crucible having an open top for containing the mixture of molten aluminium and aluminium dross;

vibration means for vibrating the crucible when supported on the table;

a frame adapted to support a paddle means, means for rotating the paddle means and means for relatively lowering the paddle means into the mixture in the crucible for stirring the mixture with the paddle means, the paddle means comprising a rotatable plate and a plurality of tines having a generally triangular cross section attached to the plate, with a ridge of the triangular cross section being uppermost in use when the tines are lowered into the crucible;

a shroud adapted to cover the top of the crucible and maintain an oxygen reduced atmosphere in the crucible; and

a screening means comprising walls mounted to the frame which substantially surround the crucible when it is supported by the table, the screening means having at least a movable portion thereof movable between at least a first retracted position to allow access to the crucible and at least a second position where it prevents access to the crucible;

wherein simultaneous vibration of the crucible by the vibration means and stirring of the mixture by the tines is enabled with the tines moving through the dross in a shearing action mixing and tumbling the mixture and causing the droplets of aluminium to coalesce.

2. The aluminium processing apparatus of claim 1, wherein the tines are removably attached to the plate.

3. The aluminium processing apparatus of claim 1, wherein the shroud is formed from a heat insulating material and is located adjacent the rotatable means to be lowered with the paddle means to cover the crucible in use.

4. The aluminium processing apparatus of claim 1, wherein the movable portion of the screening means door that is retractable behind the screening means to provide a portal for access to the table.

5. The aluminium processing apparatus of claim 4, wherein the door is slidably movable relative to the remainder of the screening means.

6. The aluminium processing apparatus of claim 5, wherein the screening means is formed from a multi-layer structure, comprising at least an inner layer and an outer layer.
7. The aluminium processing apparatus of claim 1, wherein the paddle means comprises a plurality of tines mounted on a shaft defining a longitudinal axis supported by a frame, the shaft being adapted to be raised or lowered so that the blades may be raised when a new crucible is placed on the table located underneath the tines.
8. The aluminium processing apparatus of claim 7, wherein, in use, the shaft is located above the centre of the crucible and is rotated about its longitudinal axis by a rotating means.
9. The aluminium processing apparatus of claim 1, wherein the table is mounted on springs to assist in vibrating the crucible.
10. The aluminium processing apparatus of claim 8, wherein the frame includes two or more upright pillars and a cross-beam supported by the frame and wherein the cross-beam carries the rotating means and the shaft depends down from the cross-beam.
11. The aluminium processing apparatus of claim 1, further including one or more exhaust pipes that allow gaseous product from the process performed by the apparatus to be vented to atmosphere outside the screening means wherein the exhaust pipes incorporate a bagging system that collects the exhaust gaseous product for later disposal and extracts dust from the gaseous product and wherein the exhaust systems also include filtering or scrubbing means for cleaning or substantially cleaning the gaseous product from the process of harmful or potentially harmful constituents.
12. The aluminium processing apparatus of claim 1, further including a weighing means, such as an electronic or mechanical scale for measuring the weight of the crucible and its contents while the crucible is sitting on the table.
13. The aluminium processing apparatus of claim 11, further including a control means adapted to allow an operator to operate all features of the apparatus from a central location such that the apparatus runs normally without operator input.
14. The aluminium processing apparatus of claim 13, further including a sensor means for sensing the pressure on the paddles, the control means being arranged to determine the optimum stirring time and optimum sequence and rate of vibrations from the measurements of pressure on the paddles and/or the weight of the crucible and contents.
15. An aluminium processing apparatus for separating molten aluminium from a mixture of molten aluminium and aluminium dross comprising:

a table for supporting an insulated crucible for containing the mixture of molten aluminium and aluminium dross;

vibration means for vibrating the crucible when supported on the table;

a frame adapted to support a paddle means, means for rotating the paddle means and means for relatively lowering the paddle means into the mixture in the crucible for stirring the mixture with the paddle means, the paddle means including a plurality of tines the upper portion of which defines a generally triangular cross section

a shroud adapted to cover the top of the crucible and maintain an oxygen reduced atmosphere in the crucible; and

a screening means comprising walls mounted to the frame which substantially surround the crucible when it is supported by the table, the screening means having at least a movable portion thereof movable between at least a first retracted position to allow access to the crucible and at least a second position where it prevents access to the crucible;

wherein simultaneous vibration of the crucible by the vibration means and stirring of the mixture by the tines is enabled with the tines moving through the dross in a shearing action mixing and tumbling the mixture and causing the droplets of aluminium to coalesce.

16. The aluminium processing apparatus of claim 15, further including one or more exhaust pipes that allow gaseous product from the process performed by the apparatus to be vented to atmosphere outside the screening means wherein the exhaust pipes incorporate a bagging system that collects the exhaust gaseous product for later disposal and extracts dust from the gaseous product and wherein the exhaust systems also include filtering or scrubbing means for cleaning or substantially cleaning the gaseous product from the process of harmful or potentially harmful constituents.

17. An aluminium processing apparatus for separating molten aluminium from a mixture of molten aluminium and aluminium dross comprising:

a table for supporting an insulated crucible containing the mixture of molten aluminium and aluminium dross, the table defining vibration means for vibrating so as to vibrate the crucible supported thereon;

a frame adapted to support a paddle means or stirring means, means for rotating the paddle means and means for relatively lowering the paddle means into the mixture in

the crucible for stirring the mixture with said paddle means, said paddle means comprising a plurality of tines having a generally triangular cross section;

a screening means comprising walls mounted to the frame substantially surround the crucible when it is supported by the table, the screening means having at least a portion thereof movable between at least a first retracted position to allow access to the crucible and at least a second position where it prevents access to the crucible;

a weighing means for weighing the crucible and any contents held therein supported on the table;

a control means for controlling rotation of the paddle and operation of the vibration means further including sensor means for measuring the pressure on the paddles, the control means being operable to determine an optimum stirring time and sequence and rate of vibrations from the measurement of pressure on the paddles and the weight of the crucible as measured by the weighing means wherein simultaneous vibration of the crucible by the vibration means and stirring of the mixture by the tines is enabled with the tines moving through the dross in a shearing action mixing and tumbling the mixture and causing the droplets of aluminium to coalesce.

18. The aluminium processing apparatus of claim 17, further including one or more exhaust pipes that allow gaseous product from the process performed by the apparatus to be vented to atmosphere outside the screening means wherein the exhaust pipes incorporate a bagging system that collects the exhaust gaseous product for later disposal and extracts dust from the gaseous product and wherein the exhaust systems also include filtering or scrubbing means for cleaning or substantially cleaning the gaseous product from the process of harmful or potentially harmful constituents.

19. A method of separating molten aluminium from a mixture of aluminium and aluminium dross comprising the steps of:

removing the mixture from a furnace containing molten aluminium;

transferring the hot dross to an insulated crucible;

transferring the crucible to a table means;

inserting a paddle means into the mixture in the crucible, the paddle means comprising a rotatable means and a plurality of tines depending from the rotatable means said tines having a generally triangular cross section, with a tip or ridge of the triangular cross section being uppermost in use when the tines are lowered into the crucible;

relatively lowering a screening means such that it substantially surrounds the crucible;

stirring the mixture with the tines and simultaneously vibrating the table and crucible with the tines moving through the dross in a shearing action mixing and tumbling the mixture to cause the oxide skin on aluminium droplets in the dross to break, and to cause the aluminium droplets to coalesce such that the droplets enlarge in volume and in weight and tend to sink to the lower part of the crucible; and

removing aluminium from the lower part of the crucible.

20. The method of claim 19, wherein the steps are carried out without substantially cooling the dross, preferably at a temperature of about 750°C.

21. The method of claim 20, further including the step of placing a shroud over the crucible during the stirring step.